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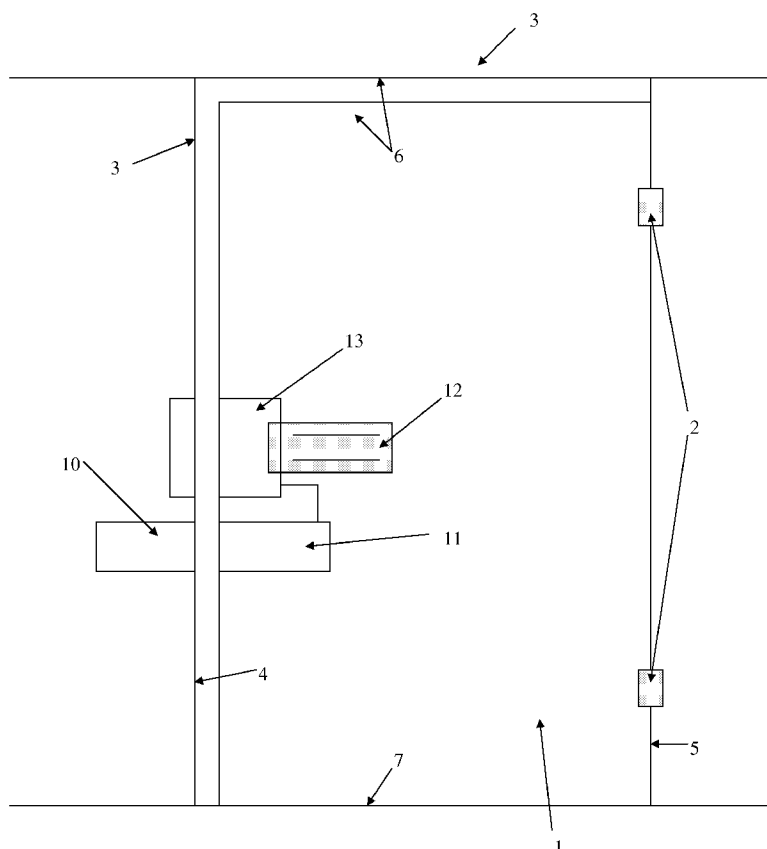
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[Continued on next page]

(54) Title: DOOR SYSTEM FOR WIRELESS POWER AND DATA TRANSFER



(57) Abstract: The invention refers to a system for opening and closing bordered spaces. In particular, the system comprises a door(1) or a similar closing device, a frame (3) carrying the door with hinges (2), doorposts (3) and a device for power and data transfer. The device for power and data transfer is wireless and includes a primary supply and control module (10), a secondary supply and control module (11), at least one actuator module (12) and at least one driver module (13) of said at least one actuator module (12), said primary (10) and secondary (11) supply and control modules being associated through a magnetic coupling; and said primary supply and control module (10) is placed on the doorpost, said secondary supply and control module (11) is placed on the door and said modules are lined up on the same axis.

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DOOR SYSTEM FOR WIRELESS POWER AND DATA TRANSFER

FIELD OF THE INVENTION

- 5 The present invention relates to the field of system for opening and closing bordered spaces, comprising a door or a similar closing device, a frame carrying the door, doorposts and a device for power, data and information transfer.

BACKGROUND ART

- 10 Access doors are more and more often provided with electronically operated locks which can, for example, be opened from remote positions or through personal identification devices of the user; moreover, in many cases it is possible to send data to (and/or receive data from) the lock; these can be simple opening / closing commands
- 15 or information to be viewed on specific viewing means (i.e. to indicate specific precautions to be taken before opening the door, justify denied access, indicate failure to close, the number of times the door is opened in succession or in a specific period of time, etc.).
- Devices which allow the aforesaid operations and, more generally,
- 20 reception, transmission and management of electrical signals from and to the door must be installed in the door itself and, both to supply them with power and to allow the flow of information, need suitable wiring which in turn requires operations (which may also be complicated) both on the door and on the surrounding building works.
- 25 Said wiring must continuously connect the door to which the control signals are to be sent to a transmission unit located elsewhere. In the case in which the door requires to be removed, this wiring must naturally also be interrupted, with consequent works required to reinstate it.
- 30 The usefulness of a simple device, which can be installed, and if necessary removed, easily without all the wires normally required and the drawbacks related thereto and which allows efficient transfer of

power, data, checks and information between a door – or analogous closing device – and the frame of the structure in which it is housed, is therefore evident.

5 SUMMARY OF THE INVENTION

The present invention relates to a system for opening and closing bordered spaces, comprising a door or a similar closing device, a frame carrying the door, doorposts and a device for power and data transfer. In particular, the device for power and data transfer is
10 wireless and includes a primary supply and control module (10), a secondary supply and control module (11), at least one actuator module (12) and at least one driver module (13) of said at least one actuator module (12), said primary (10) and secondary (11) supply and control modules being associated through a magnetic coupling; and
15 said primary supply and control module (10) is placed on the doorpost, said secondary supply and control module (11) is placed on the door and said modules lined up on the same axis.

BRIEF DESCRIPTION OF THE DRAWINGS

20 Figure 1 Block diagram of the system according to the present invention.

Figure 2 Block diagram of the primary supply and control module of the system according to the present invention.

Figure 3 Block diagram of the secondary supply and control module of
25 the system according to the present invention.

Figure 4 Block diagram of the system according to the present invention, showing further preferred locations of the coupling primary and secondary supply and control module.

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30 DETAILED DESCRIPTION OF THE INVENTION

With reference to Figure 1, the system according to the present invention includes a door (1) or a similar closing device, a frame (3)

and hinges (2) carrying the door, doorposts (4) a device for power and data transfer consisting of the following principal blocks: a primary supply and control module (10), a secondary supply and control module (11), at least one actuator module 12 and at least one driver module 13 of said at least one actuator module 12.

Said primary supply and control module 10 will, for example, be housed in the frame (3) of the door on the handle side, at the same height as and aligned with said secondary supply and control module 11, in turn housed in the door together with said actuator module 12 and said driver module 13 of said actuator module 12.

According to further preferred embodiments, said primary supply and control module (10) and said secondary supply and control module (11) are placed respectively on the doorposts and on the door of said system for opening and closing in any position (fig. 4) on the vertical doorpost-door on the hinge side 5, on the horizontal superior doorpost-door side 6, or on the horizontal lower doorpost-door side 7.

With reference to Figure 2, said primary supply and control module 10 includes: an AC/DC module 20, a DC/DC module 21, a primary control module (or CPU – Central Processing Unit) 22, a modulator module 26, a primary power supply module 23 in turn including a first half-transformer 24 which forms the primary circuit of a complete transformer, composed of the primary electrical winding and by half of the ferromagnetic core of said complete transformer.

If necessary, said primary CPU module 22 can be provided with a backup battery 25.

The AC/DC and DC/DC modules 20, 21 have the task of generating the supply voltages required by the CPU module 22 and by the primary power supply module 23 and ensure that the device according to the present invention is able to operate in the presence of both alternating and direct current input voltages.

In a preferred embodiment of the present invention, the primary CPU module 22 preferably includes a microprocessor. Said microprocessor will be connected to a data input/output line, for example belonging to an RS485 bus, from which it can read data and commands coming from external peripherals and supply them with any feedback. Said external peripherals can, for example, be magnetic card and microprocessor readers, proximity sensors, fingerprint readers, transponder keys or, in general, external electronic control devices such as personal computers and the like.

Said primary CPU module 22 will also transmit data and control signals to said modulator module 26. Said modulator module 26 in turn processes the signals received from the microprocessor according to a known modulation technique, such as FSK (Frequency Shift Keying) modulation, and sends them to said primary power supply module 23 as modulating signal of the AC voltage waveform that said primary power supply module 23 (produced, for example, by a switching voltage converter) sends to said primary half-transformer 24. In this way the control signals generated by the primary CPU module 22 are transmitted, through said half-transformer 24, to the secondary supply and control module 11.

With reference to Figure 3, said secondary supply and control module 11 includes: a second half-transformer 30, a rectification and filtering module 31, a demodulator module 32, a secondary battery charger module 33, at least one battery 35 and a secondary control module (or CPU – Central Processing Unit) 34, which will be connected to one or more actuator modules 12 through the relative driver modules 13 of said actuator modules 12. In fact, said secondary CPU module 34 will be connected to a data input/output line, for example belonging to an RS485 bus through which it can exchange data and commands with said driver modules 13 of said actuator modules 12. In this way said secondary CPU module 34 is able to address a certain number of actuator modules 12, each of which can be controlled and addressed

singly, for example, through a suitable control circuit, which can be based on a microprocessor and included in the corresponding driver modules 13.

Communication between the primary and secondary supply and control modules 10, 11 takes place by means of a magnetic coupling produced through the complete transformer composed of the two half-transformers 24, 30 mentioned above. Not only the power required to supply the components of the secondary supply and control module 11 - through the low frequency carrier injected on the primary side of the transformer - are transferred from the primary 24 to the secondary half-transformer 30, but also the information to be transmitted to the door, which can be sent as a modulating signal, i.e. in FSK format, of said low frequency carrier.

If the door is closed, the cores of the two half-transformers are facing and therefore power and information are transferred from the primary to the secondary circuit. On the other hand, when the door is open, transfer is interrupted. When the door remains closed, it is possible to transfer power and information between the primary and secondary supply and control modules 10, 11 and, consequently, it is possible to update, program and drive the actuator modules 12 housed in the door. Moreover, the secondary battery charger module 33 will keep said battery 35 charged to guarantee operation of the secondary circuits also during periods of time in which the door is open. Said battery 35 can be associated with a circuit to control the level of its charge which will be connected to said secondary CPU module 34 and which, if necessary, can activate an alarm in the event of said level dropping below a certain threshold, due, for example, to prolonged opening of the door.

Alternatively, in the event of the quantity and speed of the data and information transmitted by the primary side to the secondary side of the device according to the present invention exceeding a certain limit, said device can be provided, as shown in the Figures 2 and 3, with two

further blocks each including at least one radiofrequency transceiver module 27, 36 associated with respective CPU modules 22, 34, capable of communicating data and information to each other with a wider band compared to the mode described previously operating through magnetic coupling between the two half-transformers 24, 30. Said radio frequency transceivers 27, 36 can be produced using low power devices with limited communication ranges, such as Bluetooth or Zigbee devices.

In a preferred embodiment of the present invention, said actuator module 12 includes suitable means for viewing information. Said means for viewing information can include displays of various sizes produced with various technologies, such as liquid crystal displays (LCD) which can be positioned on the inner or outer side, or on the handle, of the door on which the device according to the present invention is installed.

In a second preferred embodiment of the present invention, said actuator module 12 includes lighting means which can, for example, be LEDs (light emitting diodes) of the monochrome or polychrome (RGB) type, or more complex systems such as arrays of LEDs, or lighting devices based on filament or fluorescent lamps also in this case positioned on the inner or outer side, or on the handle, of the door on which the device according to the present invention is installed.

In a further preferred embodiment of the present invention, said actuator module 12 includes devices for opening and closing the door in which it is installed, such as automatic electromechanical locks and the like, if necessary associated with means for recording and counting the opening and closing events of said door and relative temporal duration, said recording and counting means being produced, for example, by suitable routines implemented in the firmware of said secondary CPU module 34.

In a further preferred embodiment of the present invention, said actuator module 12 includes means to generate heat, such as devices to heat the handle of said door, for example electrical heating elements.

- In a further preferred embodiment of the present invention, said
- 5 actuator module 12 includes means for acoustic reproduction and emission, such as loudspeakers and acoustic diffusers, or for the emission of perfumed essences, such as nebulizers and the like.

CLAIMS

1. System for opening and closing bordered spaces, comprising a door or a similar closing device, a frame and hinges carrying the door, doorposts and a device for power and data transfer characterized in that,

- the device for power and data transfer is wireless and includes a primary supply and control module (10), a secondary supply and control module (11), at least one actuator module (12) and at least one driver module (13) of said at least one actuator module (12), said primary (10) and secondary (11) supply and control modules being associated through a magnetic coupling; and

- said primary supply and control module (10) is placed on the doorpost, said secondary supply and control module (11) is placed on the door and said modules are lined up on the same axis.

2. The system for opening and closing according to claim 1, wherein said primary supply and control module (10) and said secondary supply and control module (11) are placed respectively on the doorposts and on the door of said system for opening and closing in any position:

- on the lock-side vertical doorpost-door,
- on the hinge-side vertical doorpost-door,
- on the horizontal superior doorpost-door side, or
- on the horizontal lower doorpost-door side.

3. The system according claims 1 or 2, wherein said primary supply and control module 10 includes: an AC/DC module (20), a DC/DC module (21), a primary CPU (22), a modulator module (26), a primary power supply module (23), and, if necessary, a backup battery (25).

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4. The system according claim 3, wherein said primary power supply module (23) includes a first half-transformer (24).

5. The system according claims 3-4, wherein said primary power supply module (23) includes a voltage converter of the switching type.

6. The system according claims 3-5, wherein said primary CPU module (22) includes a microprocessor, preferably said microprocessor is associated with a data input/output line compatible with RS485 standard, more preferably said data input/output line is associated with at least one external peripheral belonging to the group including: magnetic card and microprocessor readers, proximity sensors, fingerprint readers, transponder keys, external electronic control devices such as personal computers and the like.

7. The system according claims 3-6, wherein said modulator module (26) is associated with said primary power supply module (23) so that the output signal of said modulator module (26) forms the modulating signal of the AC voltage waveform sent to said primary half-transformer (24).

8. The system according claims 1-7, wherein said secondary supply and control module (11) includes: a second half-transformer (30), a rectification and filtering module (31), a demodulator module (32), a secondary battery charger module (33), at least one battery (35) and a secondary CPU (34) associated with at least one of said actuator modules (12) through said driver modules (13) of said actuator modules (12).

9. The system according claims 1-8, wherein said magnetic coupling is produced through the electrical transformer produced by said two half-transformers (24, 30).

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10. The system according claims 8-9, wherein said at least one battery (35) is associated with a circuit to control its level of charge, in turn associated with said secondary CPU module (34) so that, if necessary, it activates an alarm in the event of said level of charge dropping below a certain threshold.

11. The system according claims 8-10, wherein said secondary CPU module (34) includes a microprocessor.

12. The system according claims 1-11, wherein said primary (10) and secondary (11) supply and control modules include at least one radiofrequency transceiver module (27, 36) associated with the respective primary (22) and secondary (34) CPU modules, preferably said radiofrequency transceiver (27, 36) includes devices of the Bluetooth or Zigbee type.

13. The system according claims 11-12, wherein said microprocessor is associated with a data input/output line compatible with the RS485 standard, preferably said data input/output line is associated with said driver modules (13) of said actuator modules (12).

14. The system according claims 1-13, wherein said driver modules (13) include a suitable control circuit, which can be based on a microprocessor and associated with said data input/output line.

15. The system according claims 1-14, wherein said actuator modules (12) are chosen from the group including: means for viewing information, lighting means, means to open and close doors and the like, heat producing means, means for acoustic reproduction and emission, means for the emission of perfumed essences; preferably said means for viewing information include liquid crystal displays (LCD); more preferably lighting means are chosen from the group

including: single LEDs (light emitting diodes) of the monochrome or polychrome (RGB) type, arrays of LEDs, lighting devices based on filament or fluorescent lamps; most preferably said means to open and close doors and the like include automatic electromechanical locks.

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16. The system according claims 1-14, wherein said means to open and close doors and the like are associated with means to record and count the opening and closing events of said doors and the like and the relative temporal durations, said recording and counting means being produced, for example, by suitable routines implemented in the firmware of said secondary CPU module (34); preferably said heat producing means include electrical heating elements; more preferably said means for acoustic reproduction and emission include loudspeakers and acoustic diffusers; most preferably said means for the emission of perfumed essences include nebulizer devices.

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17. The system according claims 1-14, wherein at least one of said actuator modules (12) is included in the handle of said door.

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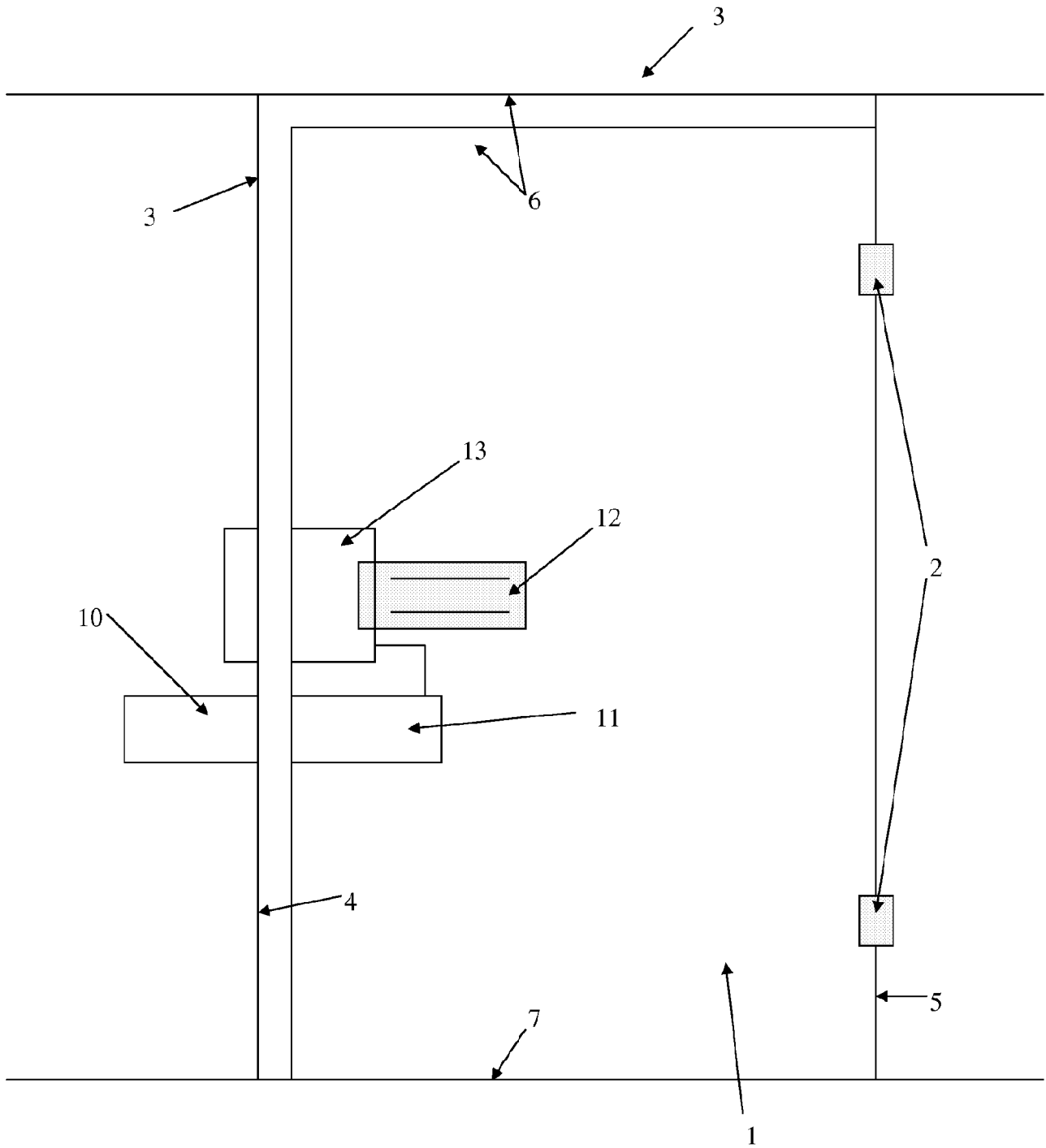


Fig. 1

2/3

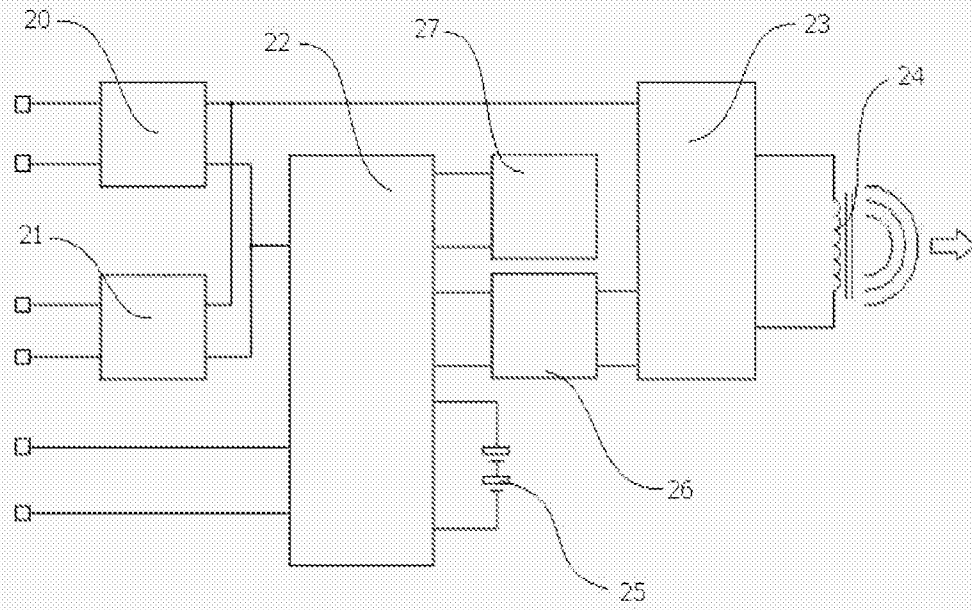


Fig. 2

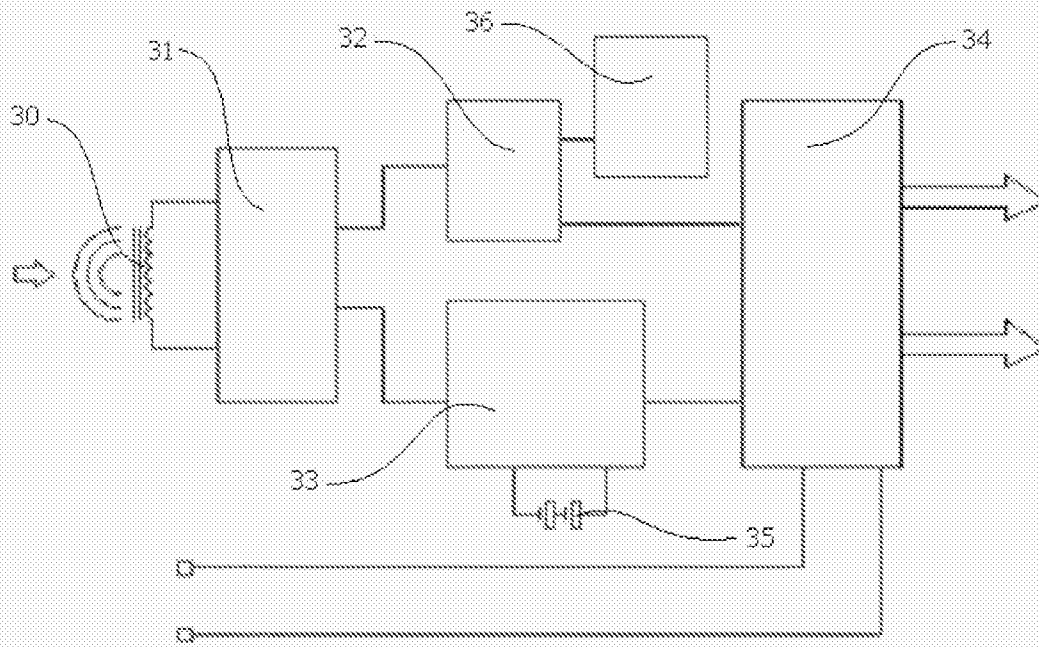


Fig. 3

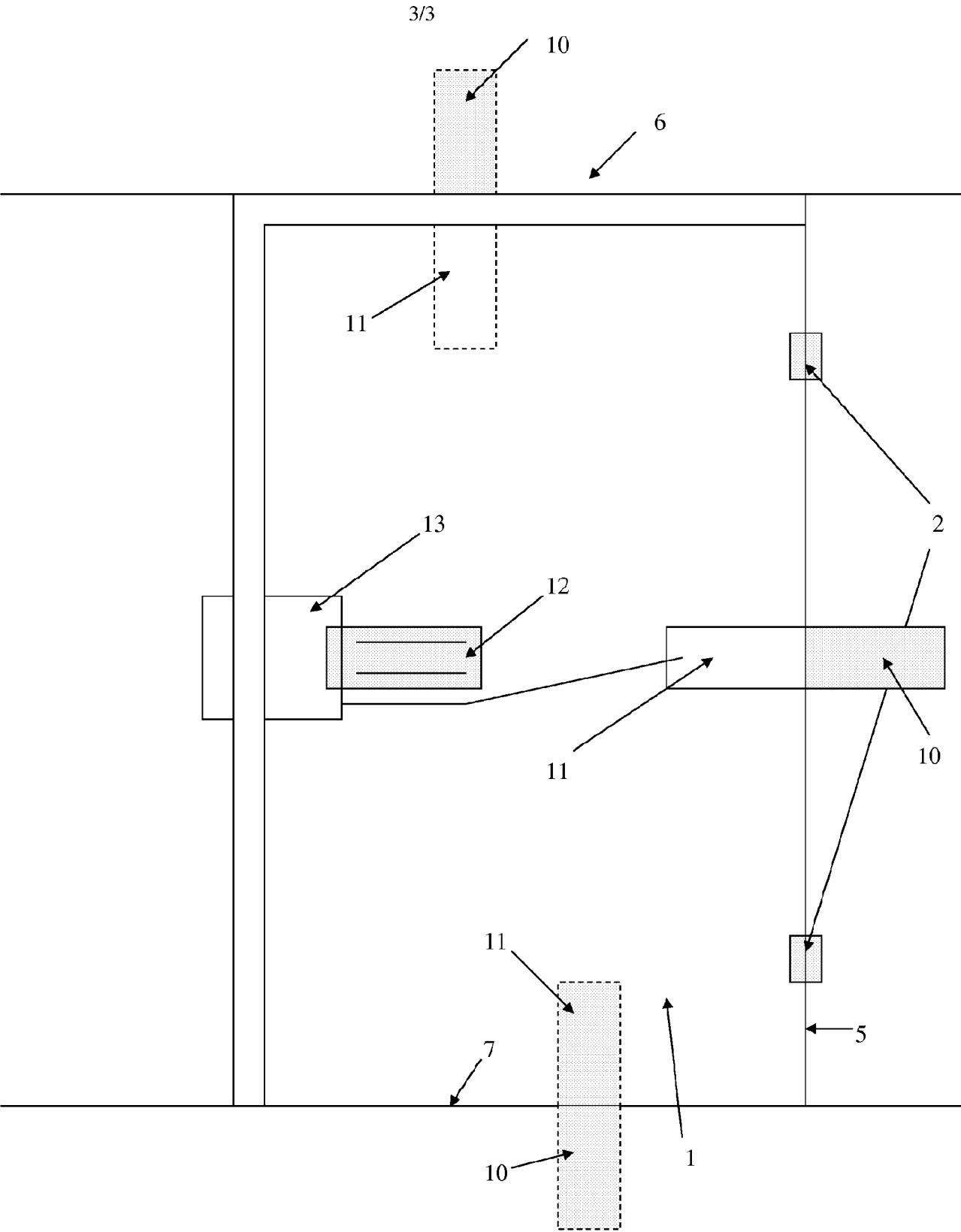


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/050665

A. CLASSIFICATION OF SUBJECT MATTER

INV. G07C9/00 E05B47/00 H04B5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G07C E05B H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	the whole document	12
X	US 6 525 644 B1 (STILLWAGON WOODROW C) 25 February 2003 (2003-02-25) abstract; figure 1 column 4, line 66 - column 5, line 18 column 5, line 42 - column 7, line 27 column 9, line 42 - column 10, line 60	1-11, 13-17
Y	WO 2005/002076 A (SIEMENS AKTIENGESSELLSCHAFT; HOFER, JUERGEN; JATSCHKA, THOMAS; POHL, AL) 6 January 2005 (2005-01-06) page 4, line 4 - page 6, line 31 page 8, line 1 - page 9, line 2	12
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

16 April 2007

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 6 275 143 B1 (STOBBE ANATOLI) 14 August 2001 (2001-08-14) column 1, line 13 - line 21 column 2, line 1 - column 3, line 8 column 3, line 43 - line 53 column 3, line 54 - line 67 column 5, line 18 - line 54; figures 2,3 column 6, line 5 - line 13 -----	1-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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